

## BOUNDS ON THE LOCATING-DOMINATION NUMBER AND DIFFERENTIATING-TOTAL DOMINATION NUMBER IN TREES

NADER JAFARI RAD AND HADI RAHBANI

*Department of Mathematics  
Shahrood University of Technology  
Shahrood, Iran*

**e-mail:** n.jafarirad@gmail.com

### Abstract

A subset  $S$  of vertices in a graph  $G = (V, E)$  is a *dominating set* of  $G$  if every vertex in  $V - S$  has a neighbor in  $S$ , and is a *total dominating set* if every vertex in  $V$  has a neighbor in  $S$ . A dominating set  $S$  is a *locating-dominating set* of  $G$  if every two vertices  $x, y \in V - S$  satisfy  $N(x) \cap S \neq N(y) \cap S$ . The *locating-domination number*  $\gamma_L(G)$  is the minimum cardinality of a locating-dominating set of  $G$ . A total dominating set  $S$  is called a *differentiating-total dominating set* if for every pair of distinct vertices  $u$  and  $v$  of  $G$ ,  $N[u] \cap S \neq N[v] \cap S$ . The minimum cardinality of a differentiating-total dominating set of  $G$  is the *differentiating-total domination number* of  $G$ , denoted by  $\gamma_t^D(G)$ . We obtain new upper bounds for the locating-domination number, and the differentiating-total domination number in trees. Moreover, we characterize all trees achieving equality for the new bounds.

**Keywords:** locating-dominating set, differentiating-total dominating set, tree.

**2010 Mathematics Subject Classification:** 05C69.

### REFERENCES

- [1] M. Blidia, M. Chellali, F. Maffray, J. Moncel and A. Semri, *Locating-domination and identifying codes in trees*, Australas. J. Combin. **39** (2007) 219–232.
- [2] M. Blidia and W. Dali, *A characterization of locating-domination edge critical graphs*, Australas. J. Combin. **44** (2009) 297–300.
- [3] M. Blidia and W. Dali, *A characterization of locating-total domination edge critical graphs*, Discuss. Math. Graph Theory **31** (2011) 197–202.  
doi:10.7151/dmgt.1538

- [4] M. Blidia, F. Favaron and R. Lounes, *Locating-domination, 2-domination and independence in trees*, Australas. J. Combin. **42** (2008) 309–319.
- [5] M. Chellali, *On locating and differentiating-total domination in trees*, Discuss. Math. Graph Theory **28** (2008) 383–392.  
doi:10.7151/dmgt.1414
- [6] X.-G. Chen and M.Y. Sohn, *Bounds on the locating-total domination number of a tree*, Discrete Appl. Math. **159** (2011) 769–773.  
doi:10.1016/j.dam.2010.12.025
- [7] F. Foucaud, M.A. Henning, C. Löwenstein and T. Sasse, *Locating-dominating sets in twin-free graphs*, Discrete Appl. Math. **200** (2016) 52–58.  
doi:10.1016/j.dam.2015.06.038
- [8] T.W. Haynes, M.A. Henning and J. Howard, *Locating and total dominating sets in trees*, Discrete Appl. Math. **154** (2006) 1293–1300.  
doi:10.1016/j.dam.2006.01.002
- [9] T.W. Haynes, S.T. Hedetniemi and P.J. Slater, *Fundamentals of Domination in Graphs* (Marcel Dekker, Inc., New York, 1998).
- [10] M.A. Henning and N. Jafari Rad, *Locating-total domination in graphs*, Discrete Appl. Math. **160** (2012) 1986–1993.  
doi:10.1016/j.dam.2012.04.004
- [11] M.A. Henning and C. Löwenstein, *Locating-total domination in claw-free cubic graphs*, Discrete Math. **312** (2012) 3107–3116.  
doi:10.1016/j.disc.2012.06.024
- [12] W. Ning, M. Lu and J. Guo, *Bounds on the differentiating-total domination number of a tree*, Discrete Appl. Math. **200** (2016) 153–160.  
doi:10.1016/j.dam.2015.06.029
- [13] J.L. Sewell and P.J. Slater, *A sharp lower bound for locating-dominating sets in trees*, Australas. J. Combin. **60** (2014) 136–149.
- [14] S.J. Seo and P.J. Slater, *Open neighborhood locating dominating sets*, Australas. J. Combin. **46** (2010) 109–119.
- [15] P.J. Slater, *Dominating and location in acyclic graphs*, Networks **17** (1987) 55–64.  
doi:10.1002/net.3230170105
- [16] P.J. Slater, *Dominating and reference sets in graphs*, J. Math. Phys. Sci. **22** (1988) 445–455.

Received 7 September 2016  
 Revised 15 December 2016  
 Accepted 15 December 2016